

CLAIMS:

1. A tubular article in an expanded state having an outer surface, the tubular article comprising:

a mixture comprising an elastomer, a pigment, and an energy beam absorber;

and

focused energy beam-induced indicia located on the outer surface, wherein the tubular article is capable of being placed in a relaxed state, and wherein the indicia is legible to an unaided eye of an individual with 20/20 vision located at least about 36 centimeters away from the indicia when the tubular article is in the expanded state and when the tubular article is in the relaxed state.

2. The tubular article of claim 1, wherein the elastomer comprises a terpolymer of an ethylene-propylene-diene monomer.

3. The tubular article of claim 1, wherein the mixture further comprises filler material selected from silica, clay, and combinations thereof.

4. The tubular article of claim 3, wherein the mixture further comprises a silane coupling agent.

5. The tubular article of claim 1, wherein the mixture further comprises a peroxide.

6. The tubular article of claim 5, wherein the mixture further comprises an acrylic co-agent.

7. The tubular article of claim 5, wherein the mixture further comprises zinc oxide.

8. The tubular article of claim 1, wherein the mixture further comprises an antioxidant material.

9. The tubular article of claim 1, wherein the indicia comprises a first color determined in part by the energy beam absorber, and the outer surface comprises a second color determined in part by the pigment.

10. The tubular article of claim 9, wherein the second color is selected from a group consisting of white and yellow.

11. The tubular article of claim 10, wherein the indicia comprises a laser-induced charred portion of the outer surface.

12. The tubular article of claim 1, wherein the indicia comprises a laser-induced foamed portion of the outer surface.

13. The tubular article of claim 1, wherein the tubular article comprises a radial wall with a thickness that ranges from about 0.76 millimeters to about 2.29 millimeters.

14. The tubular article of claim 13, wherein the thickness of the radial wall ranges from about 1.27 millimeters to about 1.78 millimeters.

15. The tubular article of claim 1, wherein:
the elastomer constitutes about 25.0% to about 40.0% by weight of the
compositional mixture;
the pigment constitutes about 1.0% to about 5.0% by weight of the
compositional mixture; and
the energy beam absorber constitutes about 0.1% to about 2.0% by weight of
the compositional mixture, based on the total weight of the compositional mixture.

16. The tubular article of claim 1, wherein the tubular article comprises a radial wall with an inner diameter, and wherein the inner diameter increases about 150% to about 300% when the tubular article is expanded from the relaxed state to the expanded state.

5 17. The tubular article of claim 16, wherein the inner diameter increases about 200% to about 250% when the tubular article is expanded from the relaxed state to the expanded state.

18. The tubular article of claim 16, wherein the tubular article exhibits a percent
10 elongation at break of at least 600% when tested pursuant to ASTM D412.

19. A tubular article having an outer surface, the tubular article comprising:
a compositional mixture comprising:

an elastomer;
15 a pigment;
an energy beam absorber;
hydrocarbon oil;
an antioxidant material; and
zinc oxide; and

20 focused energy beam-induced indicia located on the outer surface, wherein the tubular article is capable of being placed in a relaxed state, and wherein the indicia is legible to an unaided eye of an individual with 20/20 vision located at least about 36 centimeters away from the indicia when the tubular article is in the expanded state and when the tubular article is in the relaxed state.

25 20. The tubular article of claim 19, wherein the elastomer is selected from terpolymers of an ethylene-propylene-diene monomer, silicone elastomers, fluoroelastomers, fluorosilicone elastomers, and combinations thereof.

21. The tubular article of claim 19, wherein the elastomer comprises a terpolymer of an ethylene-propylene-diene monomer, the terpolymer of the ethylene-propylene-diene monomer constituting about 25.0% to about 40.0% by weight of the compositional mixture, based on the total weight of the compositional mixture.

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22. The tubular article of claim 19, wherein the elastomer comprises a fluoroelastomer, the fluoroelastomer constituting about 80.0% to about 90.0% by weight of the compositional mixture, based on the total weight of the compositional mixture.

10 23. The tubular article of claim 19, wherein the compositional mixture further comprises a peroxide.

24. The tubular article of claim 23, wherein the compositional mixture further comprises an acrylic co-agent.

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25. The tubular article of claim 19, wherein the compositional mixture further comprises filler material selected from silica, clay, and combinations thereof.

20 26. The tubular article of claim 25, wherein the compositional mixture further comprises a silane coupling agent.

27. The tubular article of claim 19, wherein:
the elastomer constitutes about 25.0% to about 40.0% by weight of the
compositional mixture;

25 the pigment constitutes about 1.0% to about 5.0% by weight of the
compositional mixture;

the energy beam absorber constitutes about 0.1% to about 2.0% by weight of
the compositional mixture;

30 the hydrocarbon oil constitutes about 5.0% to about 20.0% by weight of the
compositional mixture;

the antioxidant material constitutes about 0.1% to about 1.0% by weight of the compositional mixture; and

the zinc oxide constitutes about 0.1% to about 1.0% by weight of the compositional mixture, based on the total weight of the compositional mixture.

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28. A method of marking a tubular article having an outer surface, the method comprising:

providing the tubular article, the tubular article comprising an elastomer, a pigment, and an energy beam absorber;

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expanding the tubular article from a relaxed state to an expanded state;

forming indicia on the outer surface with a focused energy beam; and

allowing the tubular article to cold shrink from the expanded state.

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29. The method of claim 28, wherein providing the tubular article comprises extruding and cross-linking a mixture that comprises the elastomer, the pigment, and the energy beam absorber to form the tubular article.

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30. The method of claim 28, wherein the focused energy beam comprises a laser beam.

31. The method of claim 30, wherein forming the indicia comprises charring a select portion of the outer surface.

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32. The method of claim 30, wherein forming the indicia comprises foaming a select portion of the outer surface.

33. The method of claim 30, wherein the laser beam comprises a Nd:YAG laser beam.

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